

US008782549B2

(12) United States Patent Ouyang et al.

(45) Date of Patent:

(10) **Patent No.:**

US 8,782,549 B2 Jul. 15, 2014

(54) INCREMENTAL FEATURE-BASED GESTURE-KEYBOARD DECODING

(71) Applicants: Yu Ouyang, San Jose, CA (US);

Shumin Zhai, Los Altos, CA (US); Ciprian Ioan Chelba, Palo Alto, CA (US); Xiaojun Bi, Sunnyvale, CA (US); Satoshi Kataoka, Tokyo (JP); Ken Wakasa, Tokyo (JP); Keisuke

Kuroyanagi, Tokyo (JP) (72) Inventors: Yu Ouyang, San Jose, CA (US);

Shumin Zhai, Los Altos, CA (US); Ciprian Ioan Chelba, Palo Alto, CA (US); Xiaojun Bi, Sunnyvale, CA (US); Satoshi Kataoka, Tokyo (JP); Ken Wakasa, Tokyo (JP); Keisuke Kuroyanagi, Tokyo (JP)

(73) Assignee: Google Inc., Mountain View, CA (US)

(*) Notice: Subject to any disclaimer, the term of this

patent is extended or adjusted under 35

U.S.C. 154(b) by 0 days.

(21) Appl. No.: 13/734,810

(22) Filed: **Jan. 4, 2013**

(65) Prior Publication Data

US 2014/0101594 A1 Apr. 10, 2014 Related U.S. Application Data

- (63) Continuation-in-part of application No. 13/646,521, filed on Oct. 5, 2012.
- (60) Provisional application No. 61/714,568, filed on Oct. 16, 2012.
- (51) Int. Cl.

 G06F 3/048
 (2013.01)

 G06F 3/0488
 (2013.01)

 G06F 3/023
 (2006.01)

(52) U.S. Cl.

CPC *G06F 3/04886* (2013.01); *G06F 3/04883* (2013.01); *G06F 3/0236* (2013.01)

(58) Field of Classification Search

CPC G06F 3/04886; G06F 3/04883; G06F 3/0236

(56) References Cited

U.S. PATENT DOCUMENTS

4,833,610 A 5/1989 Zamora et al. 4,847,766 A 7/1989 McRae et al. (Continued)

FOREIGN PATENT DOCUMENTS

EP 0844570 A2 5/1998 EP 1603014 A1 7/2005 (Continued)

OTHER PUBLICATIONS

Response to Office Action dated Jan. 31, 2013, from U.S. Appl. No. 13/646,521, filed Apr. 30, 2013, 17 pp.

(Continued)

Primary Examiner — Omar Abdul-Ali Assistant Examiner — Anil Bhargava

(74) Attorney, Agent, or Firm — Shumaker & Sieffert, P.A.

(57) ABSTRACT

In one example, a method includes outputting, at a presence-sensitive display operatively coupled to a computing device, a graphical keyboard comprising a plurality of keys and receiving an indication of a gesture to select a group of keys of the plurality of keys. The method may further include determining, in response to the indication, a candidate word based at least in part on the group of keys. The method may further include determining a group of alignment points traversed by the gesture and respective cost values for each of at least two keys of the plurality of keys. The method may further include comparing the respective cost values for at least each of at least two keys of the plurality of keys to determine a combination of keys having a combined cost value and outputting the candidate word that is based on the respective cost values.

23 Claims, 6 Drawing Sheets

